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UNITED STATES DEPARTMENT OF AGRICULTURE

FOREST SERVICE

BRANCH OF RESEARCH

MONTHLY REPORT

OF

FOREST EXPERIMENT STATIONS
FOREST PRODUCTS
FOREST ECONOMICS
RANGE RESEARCH

MAY 1934

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BRANCH OF RESEARCH

May, 1934

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APPALACHIAN FOREST EXPERIMENT STATION

General

The ninth meeting of the Appalachian Forest Research Council, held at Asheville, May 31-June 1, was an outstanding one due to the presence of the Forester, who addressed the Council and took part in a field trip in and near the Bent Creek Experimental Forest. About 70 Council members and guests were present, including Directors Zon and Demmon, Regional Forester Kircher, E. F. McCarthy, C. F. Korstian, and three forest supervisors. The Station's program, presented by various members of the staff and cooperators, was from the standpoint of the land use problems of the region.

Between sessions the Council and guests attended a luncheon given by Asheville civic clubs in behalf of the North Carolina Forestry Association, at which Mr. Silcox was the speaker. His address emphasized the importance of forestry in the land use problems of the region, and particularly in the present social and economic movements, for the benefit of human relations.

I. T. Haig, of the Northern Rocky Mountain Station, and I. F. Eldredge, of the Southern, visited the Station and discussed their work with the staff. Haig's talk was on germination and survival of western white pine, Eldredge's on the forest survey.

Parties of eight students from the New York State College of Forestry at Syracuse, under the leadership of Prof. Nelson C. Brown, and twelve from the North Carolina State College at Raleigh, led by Prof. G. K. Slocum, visited the Station. Other visitors included Dr. E. P. Meinecke, of the Bureau of Plant Industry, and G. R. Schulze, of the National Park Service.

Management, Mountains

A plan for making inventories and topographic, forest type, and condition class maps for the new experimental forests was prepared by Barrett. A ten per cent estimate is to be made with strips a chain wide every 10 chains. The plan includes the permanent marking of all strips by 2 chain units, permitting the segregation of data for like units and the location of individual units in the field for experiments. A tally of trees by 1-inch classes will be made for each of these units and will form the basis for future growth determinations within the various type and condition classes. Type will be determined from the tallies of each plot. The condition classes used will be those outlined in ECW Publication No. 1 Field work on this project has been started.

Buell started a study of methods of controlling laurel and Rhododendron. These species often cover large forest areas to the virtual exclusion of tree reproduction. Tenth-acre plots have been laid out on

(Over)

the Bent Creek Experimental Forest. Laurel and rhododendron stems on part of these have been mapped. The shrubs on one plot have been grubbed out. On the other plots it is planned to cut, cut and burn, and to use various chemical treatments on the plants and the soil.

Management - Coastal Plain

Much of the month was spent reconnoitering areas for an experimental forest. One area containing good representation of one condition class was found. A portion of this area when purchased by the National Forest organization will be set aside for experimental work. Further search will be made for an area containing other condition classes.

Reproductio n quadrats on the Windsor, N. C. selective logging plots, burned over accidentally last November, were reexamined. When these quadrats were examined seven weeks after the fire 50% of all loblolly pine reproduction (4 years old) was dead. This reexamination, four months later, showed that in the intervening period 95% of the remaining reproduction succumbed. This indicates the necessity of waiting at least four months after a winter fire before making an estimate of damage to loblolly pine reproduction.

The seed traps on the Franklin, Virginia, plots were reexamined. A fall of approximately 1-1/2 pounds of loblolly pine seed per acre since late January was shown as compared with an average fall from the 1933 seed crop of approximately 20 pounds per acre before the January examination.

A group of quadrats which were scarified just before last autumn's seed fall at Franklin, Virginia, were examined together with an equal number of adjacent unscarified quadrats and in every case unscarified quadrats supported more this years' seedlings than scarified quadrats. Further reexaminations will give data on survival on the two types of quadrats.

Streamflow and Erosion

During the month weir installations for measuring small continuous streams were made by the CCC under the supervision of Loughead on the Bent Creek and Creasman on the Coweeta Experimental Forest. Twenty-four water level recorders are being placed in operation to measure continuous or intermittent flows and to be used in constructing recording float rain gauges. Installations are being made to measure runoff from badly overgrazed and mismanaged agricultural land near the Bent Creek Experimental Forest.

One of each of the five pairs of enclosed plots, Nos. 1-10, on the Bent Creek Forest has been subjected to a heavy burning. Stormflow at the surface and at 12" below the surface has been recorded for these plots since July 1932. The records of storms that have taken place since burning indicate that considerable increase in surface stormflow has been brought about by the burning.

Tests have been made of planting recently cut road banks. A number of different grasses and legumes and 1-0 shortleaf pine seedlings have been used with different methods of planting -- direct seeding, sod transplants in furrows along the contour, and in pockets. The plants used included perennial and Korean Kudzu, honeysuckle, Lespedeza, saplin clover, redtop, and orchard grass.

In addition to the above, planting studies were carried out with different methods of making and setting stem cuttings for soil reclamation. Direct seeding of soaked red pine has been tried out in seed spots, and on plowed strips in broom sedge oldfield.

Fire Weather

Pierce reports that due to unfavorable weather conditions during the first ten days of May, the Fire-weather forecasting season was not terminated until May 12. Up to this time, forecasts were issued regularly, and distributed to forest officials and the public. April had been well favored with generous and well distributed rainfall, but temperatures had been comparatively low, with the result that vegetation was somewhat backward at the beginning of May. Consequently, with a period of comparative drought extending over the first ten days, burning conditions were more than normally serious. Considerable advance in the growth of vegetation resulted from plentiful sunshine and high temperatures; and with the advent of a period of rainfall beginning with May 11, hazard was practically eliminated.

The last half of the month was largely occupied by official trips. The majority of fire weather stations were visited for inspection and servicing of equipment, and arrangements were made to remove the Pineola, N. C. station to a more favorable location.

On May 31, and June 1, visits were made to Forest Supervisors' offices in Elkins, West Virginia, and Harrisonburg, Virginia, for the purpose of investigating the possibilities of extending the forecasting service to the Monongahela and George Washington forests. No definite decision was reached regarding the extension of the service into this district. With the participation of the Assistant Regional Forester, Mr. James E. Scott, the discussion in Elkins was centered around the need for Fire-weather research in the Southern Appalachians. Mr. Scott expressed the opinion that one of the basic needs of foresters in this district is a solution to the perplexing problem of defining fire hazard and determining fuel moisture content in terms of readily measurable weather elements. He expressed the desire to see a comprehensive fire weather research program instituted in this section by the Appalachian Forest Experiment Station in cooperation with the Fire-weather service.

Forest Pathology

Liming and Roth examined the Strumella inoculations at Edinburg, Virginia on the George Washington National Forest. Different oaks had been inoculated with the Strumella canker fungus from other oaks. Although no typical cankers were found, the bark was killed back from the point of inoculation and the organisms reisolated.

Observations were made on the amount of fruiting of Nectria canker on black walnut on plots laid out last fall near Hillsboro, West Virginia.

On the George Washington National Forest, near Edinburg and Buena Vista, Virginia, over 500 black, scarlet, red, white, and chestnut oaks were cut and carefully dissected to ascertain the extent of decay in the trunk and roots. The original purpose of this investigation was to find out if the cutting of two or more sprouts from the same stump - or one of two or more trunks caused by low branching - increased the decay hazard for the remaining sprout or branch. However it was found that the most important factor was the condition of the old stump from which the sprouts started, the stub from the cut sprout causing most damage by an indirect effect on the decay of the old stump.

In connection with this problem a study was made on the development of heartwood in oak sprouts. Also data were taken on the extent of decay in stumps of different sizes and with sprouts originating at different points on the stump.

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CALIFORNIA FOREST EXPERIMENT STATION

Forest Management - Pine Region

At Black's Mountain Drew and three 3-man crews resumed the inventory of the experimental forest. Locations for roads and compartment boundaries in the south half are being traced on the ground. For the north half ground locations will be made in advance of the cruise in so far as possible. One locator is on the job. About 15 to 20 miles of logging road will be constructed this season.

Headquarters improvements are nearing completion. Pumping equipment will soon be installed in the 600-foot well.

Fowells and Isenberg are tracing fire history in relation to reproduction and lower vegetation.

At Feather River road locatiom and construction were resumed in the experimental forest. Stowell and Dresbach began stand improvement work in the station withdrawal with a 30-man crew.

At Stanislaus Branch remeasurement of mc plots was begun by Wohletz, Tallman, and Prater. Lloyd continued measurements of seasonal growth and site factor observations. A new site factor station is being installed in fully stocked north slope white fir. Complete fireweather observations will soon be possible at the Station installation.

On May 31 an area was selected for experimental eradication of bear clover with seeding, planting, fencing, and rodent control. About June 5 Stowell will begin establishment of further sample plots in the area where Gibbs is doing stand improvement work with a 30-man crew. Seed traps have been replaced and reexamination of mr quadrats will soon be under way.

Doctor Kittredge of the University of California continued his study of litter in the experimental area. Road construction toward the new Middle Fork virgin forest experimental area is progressing rapidly, and Supervisor Hall expects the bridge may be built this season.

Kennett Area

Recent examination of planting operations has revealed considerable variation in the success of the seeding. Practically 100% of the willow cuttings have sprouted and are growing vigorously. A high percentage of sprouts have also come up from the oak seedspots. However, on the pine seedspots, which comprise a large portion of the reforestation phase of the work, sprouts have been found on only about 2% of the seedspots. The percentage varies from 10% on the areas planted in January to almost 0% on the areas planted in April. Indications are that the project should have been discontinued by the end of February. The willow planting was stopped at that time, while approximately 70% of the seeding was done between then and May 1. There was some loss due to rodent infestations, but such loss was kept to a minimum by the excellent work of the Biological Survey under direction of E. E. Horn. The greatest loss was incurred by planting the seed too deep. Indeed, from examination of 586 barren seedspots scattered over the area, it appears that 88% of the loss was from deep planting. It was known that 75% of the CWA relief workers did not do the seeding properly, but constant effort to make them adopt the correct (and more difficult) seeding methods was successful only while the men were watched.

Although seeding is still believed to be the most feasible method of reforestation on this area, even with only 10% growth, it appears certain that this percentage may be increased to 50 and possibly to 80 or 90%. Such success, though, would necessitate the use of trained, selected workers, and the authority to discharge any incompetents.

Forest Management - Redwood Region

The report on acquisition possibilities in the redwood region, which has been completed by Berry, Brundage, and Person, has taken all of Person's time except for four days spent on a trip through the redwoods with Dr. Franz Heske of Tharandt, Germany. Hallin, Stahelin, and Proffitt, a new assistant on redwood studies, also assisted on this report until the 13th, when they left for the Union Lumber Company's operation west of Willits to start the season's field work.

The major part of our efforts this year will be concentrated on yarding studies which are to be carried out in cooperation with Brundage. Our first studies are on an operation using tractors both for direct skidding and for roading. Only one 3-man crew is now in the field, but we hope, funds permitting, to use additional crews after July 1 in order that a comparison between tractor yarding and the other methods used, principally slack line and high lead, can be made the first year. The results of such studies are badly needed in order to determine how far it is practical for the operators to go toward the use of smaller, less destructive equipment.

Range Research

The San Joaquin Experimental Range, for months merely a name became a reality on May 17 with the preliminary passing of title to the United States for the old Lisenby Ranch in Madera County. This step in the acquiring of a work-center for range management studies in the Sierra Nevada foothills of the San Joaquin Valley was the red-letter event of the month for the grazing section.

The new tract, consisting of approximately 3,500 acres of rolling foothill grazing land in the blue-oak zone, is located about midway between Madera, in the irrigated valley floor, and Northfork, the headquarters of the Sierra National Forest. Falling roughly between elevations of 1,500 and 2,000 feet, the area lies in the heart of the big foothill belt in which we are committed to conduct grazing studies. From this work-center will be tackled specific problems concerning improvement and maintenance of grazing lands. Such problems include the possible increasing of both quantity and quality of range forage; the practical value of range reseeding; the safe rate of stocking such ranges, considering both watershed and forage values; the effect of fire on foothill forage; and correlated management of valley, foothill, and mountain ranges.

This new project is getting away to a highly gratifying start, from the standpoint of local interest and cooperation. Within our own official family, the Regional Office and the Sierra Forest have aided in the selection and acquisition of the area. The Sierra Forest has also generously offered to supervise construction of the headquarters buildings and extensive fencing, including rebuilding of boundary fences on line. A boundary survey to be followed by a detailed topographic survey is now in progress under the direction of the Branch of Surveys of the Regional Office, and detailed plans for headquarters buildings are in preparation by architects of the Branch of Lands. The State Division of Forestry has offered to construct a fire line around the entire boundary - a total of 14 miles of line. The Madera County Farm Advisor, Agricultural Extension Service, is much interested in range matters, has helped us in many ways since the inception of the project, and will be of material assistance in the development of the experiments. The local Farm Bureau and the Chamber of Commerce of Madera likewise have supported the project. The Division of Forestry of the University of California has followed it with especial interest and it is planned to develop certain phases of the experimental work in close cooperation with Professor Sampson and his group. Finally, we have been gratified by the interest of neighboring stockmen who have offered assistance of various kinds and who obviously will "keep close track" of everything undertaken in experimental handling of foothill ranges.

It is hoped that in July or August, a committee representing the other range experiment stations and the Washington Office, will visit the area to review on the ground our working plan and the proposed experiments.

Fire Research

Use of Chemicals in the Maintenance of Firebreaks

During the past year or more there has been a notable extension of firelines in the forest areas of California. The most notable of these recently constructed firelines, the Ponderosa Way, extends more or less continuously for a distance of several hundred miles, in a northwest-southeast direction, through the foothills on the western slope of the Sierras. For the most part, these firelines have been projected at an elevation somewhat below the better stands of coniferous timber and through areas where various species of oak are common. Since all of these oak species, as well as certain other trees and shrubs common to the chaparral, resprout freely and persistently, an effective and economical means of preventing their growth constitutes a major problem in the maintenance of the firelines.

In recent years it has been demonstrated that certain chemicals can be used as effective agents in killing various kinds of weedy vegetation. While chemicals have been used in various sections of the United States to eradicate such species as Berberis, Ribes, Crataegus, and wild apple, no data are available to indicate the possible value of chemicals for eradicating the species common in the Sierra region and under our particular soil and climatic conditions.

With the hope, therefore, that data applicable to our particular conditions might be secured, experimental chemical treatment of stumps and other weedy vegetation has been in progress during the past winter and spring months. Common salt, sodium arsenite, sodium chlorate, carbon bisulphide and fuel oil are the chemicals which have been used in this experimental work, since, from all available reports, they seem to offer the greatest probabilities of being effective.

Several hundred stumps have been treated with sodium arsenite and other chemicals. These stumps have been marked with metal discs bearing serial numbers and are being periodically examined. Sufficient time has not yet elapsed to warrant definite conclusions, but preliminary observations indicate that sodium arsenite when properly applied will prevent the resprouting of most oak stumps. The exact details of the technique involved remain to be worked out. Within a few months, it appears that sufficient data will have been compiled on the effectiveness of these chemicals as herbicides to warrant specific recommendations.

Forest Products

Logging and Milling Studies

The price differentials between lumber grades are great and the importance of attention to degrade and completeness of manufacture cannot be over-emphasized. Too often a saving of a few cents per M.B.M. effected by the time and money spent by operators on new methods and equipment for

logging operations, or transportation, or handling of logs and lumber at the mill is much more than counteracted by the loss of dollars per M.B.M., through improper treatment of the lumber after it leaves the head rig.

With these points in view, a special effort is being made this month to incorporate in the final report on methods of conducting and analyzing logging and milling studies a comprehensive and easily understood account of the problems, and of the conclusions to be drawn from such an investigation. Data from the Stanislaus study are being used to illustrate and to show, by species, the effect of the accuracy of green grades, the extent of depreciation and the degree of completeness of manufacture upon the relation between cost of remanufacture and value recovered.

A check on the accuracy of the original green grades for 6/4 inch white fir boards has just been made with the interesting results shown in the following table:

Corrected Green Grades	6/4 White fir - Marked Green Grades					
	C & Btr	1 Com	2 Com	3 Com	4 Com	5 Com
	Per Cent					
C & Btr	89.0	12.5	9.6	2.6	0.1	-
1 Com	5.6	65.9	12.3	3.3	0.4	-
2 Com	0.7	15.6	66.9	15.1	1.4	-
3 Com	1.8	4.7	8.7	72.0	16.2	1.4
4 Com	0.6	0.4	1.6	5.9	78.1	21.1
5 Com	-	-	0.1	0.3	3.3	77.4
Loss, trims & rips	2.3	0.9	0.8	0.8	0.5	0.1

The figures leave seasoning degrade out of consideration but they do reflect degrade which results from rehandling to complete the remanufacture. They show that 89% of the 6/4 white fir given an original green chain grade of C & Btr was actually found to meet C & Btr requirements at time of shipping. 5.6 per cent of this same original C & Btr went to 1 common, 0.7% to 2 common, etc. Similarly, 66.9% of the original 2 common finally emerged as 2 common. 21.9% was raised by remanufacture to higher grades, the remainder went lower.

When it is desired to find out for a given size and species of tree the value obtainable, to contrast with the cost of production, the value of such a check on the green grades is apparent.

Lumber Census

With the approval on May 17 of our Preliminary Statement on the Production of Lumber, Lath and Shingles in California in 1933, released in the form of Technical Note No. 6, the lumber census for this Region was practically completed. A few straggling returns are still being received from small operations but these were covered in Technical Note No. 6 by an "Estimated Additional Cut."

The cut for 1933 showed an increase of 109,884,000 feet, or some 16%, over that of 1932, but is still below that of 1931. The increase is about equally distributed between the pine and redwood regions. Shingle production in the redwood region increased about 200% over that of 1932.

Wood Requirements - Building Construction

Lumber conversion factors for siding were calculated from wall areas shown on building plans and found to average about 80 board feet of lumber per thousand cubic feet of house volume. Footage in sash and doors, as indicated by diagrams, averaged about 4 bd. ft. and 13 bd. ft. per thousand cubic feet of volume. Shingle ratios averaged about 50 bd. ft., on the basis of a requirement of 0.629 squares equivalent to 80 bd. ft. per square. Only about 10% of the new houses have wood siding and only about 30% have shingle roofs, however. With these allowances, the conversion factor for all lumber required in an average house was calculated to be about 810 bd. ft. per thousand cu. ft. of volume.

Returns from questionnaires sent to 111 holders of repair permits in Oakland and Berkeley during 1933 indicated that lumber used in repairs varied from 1.7 bd. ft. per dollar of repair cost for commercial alterations to 8.7 bd. ft. for porch repairs, with a weighted average of 3 bd. ft. With this ratio adjusted for changes in the price level and corrected for understatement of repair costs, the apparent consumption of lumber for repairs in Oakland and Berkeley in 1929 was about 7,000,000 bd. ft. On a proportional basis, the indicated consumption for the cities of the State in 1929 was about 93,000,000 bd. ft.

Further study of the types of building constructed from 1921 to 1930 and those existing in 1930 indicated that for the purpose of prediction about 70% of the new families should be considered as housed in detached dwellings and about 30% in apartments.

An analysis of non-residential building construction was begun by securing data from the 1929 building permits of Oakland concerning the average size of each kind of non-residential structure and the types of construction. Data obtained from contractors in San Francisco permitted calculation of lumber conversion factors for 27 different buildings of various types.

Forestry Statistics Committee

This committee of the California Economic Research Council, of which Hill is chairman, and Josephson a member, has surveyed the field of forestry statistics so far as was possible in so limited a period before it must report in accordance with the request of the Joint Committee on Government Statistics and Information Services, at Washington. Its most important conclusions are:

1. That the Lumber Code Authority is in the field of gathering lumber statistics to stay (as long as it continues to exist), because its need is so immediate that it cannot wait upon the collection of data by any centralized statistical agency and the return of tabulations to it from such

an agency. Therefore, the problem of duplication can only be solved in the reverse direction, by statistical agencies using Code Authority data. Local Code Authority officials consulted would be glad to facilitate such use.

2. Such use by statistical agencies of data currently gathered by Code Authority, as well as by the Timber Section of the Internal Revenue, would provide statistics of much greater completeness of representation than can possibly be secured by statistical questionnaire methods and, for the larger part of the field thus possible of coverage, with equal or greater accuracy. It would also make unnecessary a considerable part of the field force of the Census Bureau, which is the item most severely affected by the cut in appropriations which the Census Bureau is using as the alibi for its cutting of forestry statistics work. Moreover, it would materially help to ease the lumber industry from the load of questionnaire from all sorts of sources, which is becoming a matter of real irritation. Such use of data from the agencies mentioned should be authorized by law, and in the case of the Bureau of Internal Revenue would have to be so authorized, with careful protection of the secrecy of individual returns.

3. There is greatly needed more extensive collaboration with the Census Bureau on the part of technical agencies in each statistical field, in planning the whole set-up of data to be obtained, content and organization of questionnaires where such are used, the form of presentation of statistics, and their interpretation. This cooperation can only be saved from the curse of begging, and be given self-respecting authority, by authorization in mandatory statute.

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CENTRAL STATES FOREST EXPERIMENT STATION

General

Central States Forestry Congress. The fifth annual Central States Forestry Congress was held in Knoxville on May 29-31 under the auspices of the Tennessee State Forestry Department and the Tennessee Valley Authority. The program was diversified and well arranged, and was thoroughly enjoyed by the large group of foresters and conservationists attending the meeting. Hall and Baker represented the Station and the latter acted as chairman of the coordinating committee to prepare for publication the recommendations of the several committees which functioned during the Congress. The directors of the Appalachian, Southern, and Lake States Stations were at the meeting; chief forester Silcox gave an inspiring talk, and a paper written by E. N. Munns was very well received.

The printed Proceedings of the fourth Central States Forestry Congress (Chicago, 1933) which appeared in May included a paper by Baker entitled: "Land Utilization in the Central States from the Standpoint of a Forester."

Branch Stations. The survey and map of the Sylamore Experimental Forest in northern Arkansas have been completed, and the last of the construction work will be finished early in June. During the summer permanent growth and management plots will be established. Early in May it was necessary for Kuenzel to return to Columbus because of illness, leaving Cochran in charge temporarily.

Acquisition of an administrative site for the buildings and improvements of the proposed Shawnee Branch Station in southern Illinois has progressed nearly to completion. Construction of buildings is expected to start before July 1.

Forest Planting Study

Black Locust Tables. Under Kellogg's direction Myer finished making entries of merchantable cubic volume on the yield plot tabulation sheets. He also calculated and entered the original spacing data for each plot. Tracings of the alinement charts for the Scribner board foot and merchantable cubic foot volume tables for locust were finished, and prints in letter size are now available for all four of the black locust tables completed to date.

In line with suggestions made by F. X. Schumacher at the time of his visit, a good beginning was made in reworking locust taper tables. The size classes were averaged again, this time on a basis of heights to percentile diameters, rather than on diameters at regular heights. Somewhat more erratic average stem curves are resulting but the data are causing no trouble.

Forest Planting Survey. Early in May Kellogg and Chapman made a short trip to Pike County, Ohio, and to the plantations of the Sunday Creek Coal Company near Carbondale, Ohio. On May 9 Chapman started an extensive field trip which will include visits to plantations throughout the southern portions of the region. Several days were spent in the plantations of Alexander Thomson at "Old Timbers" in southeastern Indiana, on an area of worn-out soils within the area of Illinoian glaciation. Kellogg joined Chapman for a few days to inspect plantations in central Kentucky, near Berea and Quicksand. From there Chapman continued the survey through southern and western Kentucky, and thence into Tennessee. Contacts are being made with State and local foresters and others interested in reforestation. Chapman is also making observations of natural reproduction and native growth and its possible relation to the planting problem.

Locust Borer Investigation

H. O. Waters, a graduate student in Entomology at O.S.U. joined the staff during the middle of May and will devote his attention to the problem of the relationship of vigor of tree to survival of locust borer larvae.

Hall and Wilford spent the period May 6 to 10 making larval counts in Tennessee, Kentucky, and Illinois. Wilford spent the period of May 13 to 31 on sample plot work in Ohio, with most of his time devoted to the Carnes Experimental Area where he completed diameter and height measurements and collected a number of soil samples for moisture determination in mulched and unmulched areas.

From May 13 to 24 Hall made a trip to Long Island, southern New York, and Pennsylvania, going and returning via Washington, D. C. He was accompanied on the Long Island trip by Drs. Craighead, Swingle, Raber, and Extension Forester Cope. The purpose of this trip was to examine two so-called varieties of locust which were reported as growing there. All of the party agreed that there are unquestionably two distinct varieties of locust on Long Island. While there is little difficulty in differentiating between the two varieties in older trees, no clear cut characteristics were observed which would distinguish the smaller trees. The one variety is locally called "ship-mast" locust, or yellow locust, and the other "white" locust. The ship-mast locust has the tendency to be single stemmed, with few short lateral branches, and has bark with very deep ridges, which tend to be continuous. In contrast, the white locust tends to be forked, with many long persistent lateral branches and bark which is thinner than the ship-mast and the ridges are more or less broken up. Casual observations seemed to indicate that on the whole, the ship-mast locust was slower growing than the white. Several plantations of ship-mast locust had greater height than any which has been previously observed during the locust borer investigation. Their height was estimated to run from 100 to 125 feet.

The local history of the ship-mast locust indicates that it was probably introduced from Virginia about 200 years ago by a Captain Sands, and has been widely planted by the use of sprouts on the eastern half of Long Island. The ship-mast locust is unique in that it produces abundant flowers but does not set seed, according to local reports. The white locust, on the other hand, produces abundant seed. The latter variety has been introduced comparatively recently from nursery stock. Local opinion indicates that the ship-mast locust is much more durable than white. Seeming reliable records indicate a life of over 100 years for fence posts from ship-mast locust.

It was reported that the ship-mast locust was immune to injury by the locust borer, but the evidence gathered on this trip indicates that it may be injured to quite an extent. If anything the white locust seemed to suffer less from borer damage than did the ship-mast. However, further study is needed before any definite conclusions can be reached. Hall plans to make a detailed study of the two above varieties in their relationship to borer injury, as soon as time will permit.

Dr. Swingle, of the Bureau of Plant Industry, cooperating with the Bureau of Entomology, is propagating ship-mast locust vegetatively along with locust from other parts of the region. It is estimated that he now has about 50 thousand root sprouts that will be available for planting by next spring. Hall will cooperate on the planting of these sprouts, in various parts of the Central States Region and on a wide variety of sites.

Following the Long Island trip, Hall made larval counts in southern New York and Pennsylvania on plots which were established two years ago. The New York plots indicated a substantial increase in attack as compared to last season. One plot had about 1,000 per cent increase over last season. Two of the Pennsylvania plots showed a marked increase and two a slight decrease, while all the Tennessee, Kentucky, and Illinois plots showed a big increase in attack.

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Jack Pine Seed

Additional data on the dispersal of jack pine seed from slash was obtained by LeBarron. Slash cut early in May and piled over seed traps yielded 147 jack pine seeds per trap in about three weeks time compared to an average of less than one seed per trap dispersed from seed trees. The seed collected in the trap under the slash was the "natural fall" obtained without any disturbance or threshing of the cones contained in the slash. It becomes more and more apparent that to burn jack pine slash progressively in the winter destroys valuable seed and that seed trees cannot be depended on to supply adequate quantities.

Forest Survey

The strip survey in Minnesota is now making headway by leaps and bounds with 23 field men on the rolls. Some of the crews which have been working in the northern part of the state where 2 miles of strip is a good day's work, when transferred to central Minnesota, where there are plenty of roads and few swamps, find they can make 6 miles per day. About 1/3 of the field work for Minnesota is now completed.

Erosion-Streamflow

The concrete lysimeters constructed with NIRA funds at the LaCrosse Erosion Station have now been filled with blocks of soil and "cemented" together with puddled clay. But if it doesn't rain (and apparently it won't) there will be no early opportunity of getting data on percolation, etc.

Drought

The drought tightened its grip on the region. Over a million emaciated cattle are being purchased by the Federal Government. Governor Olson has placed an embargo against shipment of feeder stock into the state of Minnesota. Some livestock is being driven to the north woods where it will be herded on woods pasture. FERA announced that conservation construction projects such as dam building and well digging would be undertaken similar to CWA work.

Throughout central and southern Minnesota planted Scotch pine and white pine are dying from the blistering winds and no doubt there will be heavy losses in reproduction further north. During April the relative humidity got as low as 10 per cent in St. Paul. In May all records were broken when the thermometer reached 107° F. in St. Paul. Only about 1/3 of the normal precipitation has fallen in the Twin Cities so far this year.

Discovery

Discoveries on the Experimental Forests are apparently not all limited to matters of science and do not all deal with forestry.

Early in May John Sirin, a trail worker on the Kawishiwi Experimental Forest, ran upon a bear. The bear was cross but John was not alarmed since he was an experienced woodsman and carried an axe. After backing away from the bear a goodly distance he stopped to reconnoiter. The bear was no longer a menace but right under foot was a man's skeleton. This was a different matter!

Since the remains were found near a beaver dam, the assumption is that some beaver poacher had met with "an accident" a year or two ago and had perished. To date, no identification has been made.

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NORTHEASTERN FOREST EXPERIMENTAL STATION

During the month construction of the headquarters building units was completed at the Bartlett and Gale River Experimental Forests. The contract was approved and let for buildings at the Chenango Experimental Forest and actual construction work was begun at the last mentioned area during the latter part of the month.

Fire Damage

Despite the judicious use of kerosene and blow torches, Stickel and his crew were hard put to burn over the fire damage plot on the Bartlett Experimental Forest. All who were present at the attempted experimental burn are unanimous in agreeing that the term "asbestos forest" aptly characterizes the uncut hardwood portions of the White Mountain National Forest. Only about 4 out of the 10 acres of the plot were finally burned. It is planned to get both bark and wound data this summer on the 600 odd trees which show bark discoloration and to burn over the remaining portion of the plot next spring.

Forestation

Stewart and Morey, with the aid of two assistants, supervised the planting of approximately 90,000 trees by Civil Conservation Corps workers in the Chenango Experimental Forest in central New York.

Additional plantings of 2-0 and 2-1 Norway pine, white pine, Norway spruce, and white spruce were made for the root studies which were started last year.

White pine weevil control studies included pure plantings of white pine spaced 4x4 and 6x6 feet, and various row-wise mixtures of white pine with red oak, white pine with black locust, and white pine with white ash, all spaced 6x6 feet.

Small quantities of hemlock, white ash, and Norway spruce were also set out as pure plantations.

Due to a drought, which appeared to be more severe than that of May, 1933, a high mortality may occur on the drier portions of the newly planted areas.

Mensuration

Reineke completed tables for total cubic foot volume with bark and branches for sugar maple, red maple, yellow birch, paper birch, beech, and white ash, for trees 12 inches d.b.h. and under.

Management; Hemlock

Three plots established on Mount Toby in 1924 were remeasured. On two plots, Norway and northern white pines were planted at approximately 6x6 spacing in the openings in a residual stand of hemlock left after removal of all hardwoods. The third (check) plot was not planted. A release cutting of the hardwood sprouts was made in 1929. A second release cutting was made in connection with the current investigation.

Both species of pine are doing well in the larger openings, with Norway pine developing but poorly in the very small openings. Maximum heights are eleven feet for white pine and twelve for Norway. Weevil attacks on the white pine have been light. Hardwood sprouts on the check plot have attained a height of 12 to 16 feet, with 6,048 stems per acre over 4-1/2 feet in height.

Entomology

MacAloney reports that observations made during May indicate no noticeable reduction in white pine weevil attack in 1934. The heavy snowfall in New England gave good protection during hibernation. However, because of the decrease which has occurred over the region as a whole for several years, it is suggested that, wherever it is practicable to do so, infested tips should be removed and burned before the adults emerge. This operation will aid in the reduction of the weevil population and a careful cutting operation will result in an ultimate improvement of the stand.

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NORTHERN ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION

The month of May has seen the completion of several major jobs and the starting of what promises to be our busiest field season. Weidman's Ponderosa Pine Logging Practice Bulletin was reworked in accordance with reviewers' criticisms and submitted for publication, and Anderson's Selective Logging manuscript was completed and submitted to reviewers and the editor.

Twenty-two men were given two weeks' training in mapping and cruising and started in on the Forest Survey projects in Montana, Idaho and Washington. Five men began work on the various phases of our range investigations. Eight

temporary assistants were placed in the field on silvicultural studies and four men started the season for fire research. In addition, CC camps were started on the Priest River and Deception Experimental Forests. In both instances about half the man power will be used on blister rust control, one quarter on road construction and the balance on stand improvement or other research activities.

Logging and Milling

During the month Anderson completed the final report on the A.C.M. ponderosa pine selective logging study. The report has been prepared in form suitable for publication as a short bulletin.

As another result of the study, Anderson has developed an economic classification of ponderosa pine trees, based on the quality of lumber produced. This classification is based on the analysis of 231 trees, which is probably not a sufficient number to give results significant of the average stand conditions throughout the Inland Empire. Consequently, they should be considered as preliminary and subject to revision as additional data are gathered. They do, however, constitute an excellent basis for the development of economic tree grades in future selective logging studies. Ability to identify these tree grades should be of material benefit to any forester charged with the designation of trees for cutting on any selective logging operation.

Class 1 - Bull Pine - Young

Age, usually not over 120 years old, but occasionally up to 160 years old; lumber production, produce from 50% to 80% of #2 common lumber; size, seldom over 18 inches d.b.h; silvicultural tree class, usually class 1 and 2 and rarely class 4; branching habit, dead and green branches usually mixed from breast height to top of first log, mostly green branches from this point upward.

Class 2 - Bull Pine - Older

Age, usually not over 250 years old; lumber production, produce from 50% to 80% #3 common and poorer lumber including #3 shop and inch shop; size, rarely under 18 inches in size and seldom over 30 inches d.b.h; silvicultural tree class, usually class 3 or 4 and sometimes 2; branching habit, numerous small to medium sized, dead, spike branches, persistent on top half or two-thirds of butt log, extending up trunk to green branches.

Class 3 - Shop Type

Age, always mature or overmature, over 300 years of age; lumber production, yield from 25% to 40% of shop lumber (all grades), with lesser amounts of D and better select; size, rarely under 26 inches in d.b.h; silvicultural tree class, most frequently classes 4 and 5 and sometimes classes 3 and 7; branching habit, one to two logs usually surface clear and free from limbs, green and dead spike limbs closely spaced precluding the production of shop lumber.

Class 5 - Inferior Trees

Age, usually mature or overmature but may be any age; lumber production, invariably over 75% of 3 common and poorer with considerable amount of 5 common in defective trees; size, may be any size; silvicultural tree class, usually classes 4, 5 and 7, but may be any class.

Census

In forwarding a large consignment of schedules to Washington on April 26, the Idaho-Montana lumber and timber products census was reported to be 98 per cent completed. A delinquent list, numbering about 60 concerns at that time, was disposed of during May. Returns expected from two small sawmill operators who have not reported, will not materially affect the cut figures for 1933 shown in the following comparative statement or production for the last two years.

LUMBER SAWED - M FEET BOARD MEASURE
(Mills Cutting Less than 50 M Feet During Year Excluded)

State	1932	1933	Per cent of Increase 1932 - 1933
Idaho	248,378	316,473	+ 27.4
Montana	111,048	124,516	+ 12.1
Combined Cut	359,426	440,989	+ 22.6

In addition to the active mills cutting 50 M feet and upward, 72 mills in Idaho and 66 Montana mills reported production amounting to less than 50 M feet each in 1933. Additional production by these very small mills amounted to 1,869 M for Idaho and 1,452 M for Montana.

Comparison of the regional summary for 1933 with the 1932 records shows not only a substantial increase in production but a 27 per cent decrease in the total number of mills reported idle in these two states.

Silviculture

Haig returned during the last week in May from a winter detail in Washington, spent largely in assisting in the Division of ilvics. During the latter part of this detail, however, Haig was enabled to make effective use of the Department library in completing the literature review for a proposed article dealing with the influence of physical factors of site upon initial seedling survival. The detail also furnished Haig with the opportunity of paying an interesting and instructive visit to several of the eastern stations, including a few days each at Allegheny and Appalachian stations and a somewhat longer period at the Southern. One of the most impressive things about this trip, in addition to the remarkable rate of growth

displayed in some sections of the southern pineries, was the impetus being given to investigative work in the East by the opportunity to build up for the first time experimental areas in Station ownership. The lack of such areas has apparently been a severe handicap to some of the eastern stations in installing long time experiments, a handicap which has not been as noticeable in the West where land under federal ownership was available for use even prior to the establishment of experimental forests. The emergency program has also afforded at all of these stations, as at the Northern Rocky Mountain station, an opportunity to pick up back compilation work with all of the resulting advantages, though it has also resulted in some interruption of current research work because of the necessity of supervision of emergency work operations.

Immediately following the return to Missoula, Haig spent a few days in the field at Priest River going over current work upon the seedling survival study with Mr. Carl Ostrom, who is handling the field work this summer upon that project. The current season's work includes a study of second-year survival upon one series of quadrats and an initial year's work upon a second series of quadrats in a more sheltered northerly slope habitat. The latter set of installations have been materially damaged by rodents, chiefly mice, who have dug out and eaten a considerable portion of the white pine seed sown last fall, most of this work taking place just before or during spring germination. Many white pine seedlings have also been nipped off by rodents immediately following germination. Some quadrats have been resown and it may be still possible to bring these through with the aid of intensive poisoning operations.

Fire

Gisborne spent the first half of May at the Priest River branch getting the fire-weather work under way. Daily measurements of fuel moisture content and weather were commenced on the clear cut, half cut and full timbered inflammability stations.

Sites were selected and prepared for the installation of eight new fuel hygrographs, instruments that record duff and wood moisture and wind on a weekly chart. These instruments will be placed in pairs early in June at elevations from 2,400 to 5,500 feet, one on a north and one on a south slope. With a hygrothermograph at each station a very complete and continuous record of weather and inflammability by elevation classes, north versus south slopes, can be obtained.

Areas were selected for a study of the effect of succulent vegetation on fire danger. Volumes and moisture conditions of several important plants, together with soil moisture, will be observed at intervals during the fire season. Experimental burns on natural and de-vegetated plots are tentatively planned for the purpose of studying the effect of green vegetation on fire behavior.

Since the middle of May Gisborne has spent his entire time inspecting and installing fire weather stations on the twelve fire forests of Region One. At present, there are about 45 stations on these forests where comparable measurements of fuel moisture content and weather are being made daily.

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PACIFIC NORTHWEST FOREST EXPERIMENT STATION

General

The Station had a number of visitors during May and considerable of the Director's time, as well as that of others, was occupied in conferences with them. Messrs. Marsh, Granger and Girard were at the Station, primarily in connection with the forest survey, and Messrs. Watts, Weidman, Hornby, Bradner and DeJarnette from Missoula were here on various missions.

Dr. Franz Heske made his headquarters at the Station for several days, and McArdle and Wilson escorted him on short field trips. He gave a most interesting talk at one of our staff meetings, to which several outsiders were invited.

On their return from the forest survey field training school for type mappers, Mr. Marsh with Munger stopped at Wind River and had the experience of driving for the first time over new roads through the Trout Creek and Panther Creek divisions of the experimental forest just constructed by the CCC boys.

Approval by the Forester of our 6,417-acre experimental forest at Cascade Head in the spruce-hemlock type of the Coast Range makes the third on our list of experimental forests approved and ready for development.

Among many informal conferences during the month in which the Station took part should be mentioned a half-day discussion of the program for sustained yield studies, particularly in the ponderosa pine region, apropos of the Code, at which all those concerned in the Regional Office and the Experiment Station and Messrs. Mason and Martin of the Western Pine Association took part.

Section of Silviculture

Fire studies - Development and manufacture of instruments for fire danger stations and the preparation of a manual of instructions for observers at these stations were pushed nearly to completion during the month. The instructions will be incorporated in the R-6 Guard Handbook. A record form was devised and is ready for use.

Hornby of the Northern Rocky Mountain Forest and Range Experiment Station made an official call to delve into certain details of the visibility study, and borrowed Byram for a few days and took him to Missoula.

Morris completed his report on lightning storm occurrence and behavior in the national forests of Oregon and Washington. This will be issued immediately in mimeographed form.

Douglas Fir Silviculture - Isaac made the final revision of two reports to be submitted to the Journal of Agricultural Research--"The Forest Soil of the Douglas Fir Region and Changes Wrought Upon It By Slash Burning" and "Seedling Establishment In Relation to Environmental Factors on Logged-off Land in the Douglas Fir Region".

Ponderosa Pine Silviculture - A conference of Munger, Watts, Weidman, Meyer and Kolbe was held to iron out differences of opinion as to the contents of Weidman's manuscript on minimum requirements for the ponderosa pine type in the Northwest.

Phenology - All reports indicate that 1934 will go down in the phenology records as an extremely early year. The entire season has been consistently above normal in temperature, and this is reflected in the early dates at which the observed events have taken place.

Mensuration

The second of two sets of thinning plots in Douglas fir was established by Meyer on the Olympic National Forest in a 60-year-old stand, consisting of four plots, two of them thinned and two unthinned. The thinning was done with the aid of the neighboring CCC camp. This set makes the sixth upon which we are gathering thinning records, the youngest stand being 10 years old at the first treatment and the oldest stand 70 years old.

The field work in the spruce-hemlock yield study was resumed during the month of May by placing a field crew of three on the newly established experimental forest at Cascade Head, Oregon for the initial training period. Other areas farther south along the coast are now being measured. Although desirable stands are not as common as in the Douglas fir type, there is nevertheless a very satisfactory assortment of material, including pure stands of either species, together with stands of all degrees of mixture.

Forest Survey

Much of Andrews' and Cowlin's time, as well as that of Munger, was taken up during May with conferences with Marsh, Granger and Girard regarding final plans for the correlation and publication of the survey data for the Douglas fir region, and regarding the working plan for the ponderosa pine region. Four days were spent in the field in eastern Oregon and Washington checking the type definitions and workability of the plan; present were Marsh, Munger, Girard, eight members of the local survey staff, and Bradner and DeJarnette from the Northern Rocky Mountain Station. Following the field trip, a day was spent revising the working plan and correlating it with the plan used in Region 1.

Tucker completely copied all the county cruise in Klamath County and early in June he and Wolfe will go to Bend to copy the cruises of the Shevlin-Hixon and Brooks-Scanlon Lumber companies.

Check cruising has been completed for Klickitat and Yakima Counties, Washington, and is practically done for Kittitas County, Washington.

One-inch-to-the-mile type map negatives have been completed for Wahkiakum, Cowlitz, Clark, and Pacific Counties, Washington, all but three Oregon counties, and all national forests except the Siuslaw in Oregon and the Snoqualmie and Mt. Baker in Washington.

Master summary sheets recapitulating the inventory data by counties and ownership classes and for each of the national forests have been compiled on tracings and are being inked. When this is completed negatives will be made and blue line prints can then be furnished. These recapitulations, numbering some 40 sheets, contain in summary form all the data presented in the mimeographed booklets distributed last month.

Tabulations showing type and volume data for each national forest are being prepared and will be finished in the near future. These are on 30 x 30-inch sheets and made so that any number of blue line prints can be made.

The distribution of the mimeographed booklets of county statistics resulted in a number of repeat requests and a further edition has been mimeographed.

Forest Insurance

Shepard completed during the month final office report entitled "Forest Fire Insurance in the Pacific Coast States", a manuscript of some 460 pages which summarized his findings as to the factors that affect and the technic of a possible forest insurance undertaking in the Douglas fir, ponderosa pine, sugar pine and redwood regions of Washington, Oregon and California.

Mr. Shepard spent some time collecting data on forms of loss other than fire needed in connection with the proposed forest credits program.

The last week of the month was spent at Berkeley and San Francisco, getting the Region 5 data and also incidentally interviewing again a few of the insurance company officers contacted last fall.

New Public Domain

Wilson and Kearns were engaged wholly on office work, preparing tables, lay of the land maps, etc., which will be a part of their report on the factual phase of the new public domain project.

Wilson delivered addresses on instability of forest land ownership as follows: May 10 - Agricultural Forum, Portland Chamber of Commerce, Portland, Oregon; May 22 - Bankers and Bank Directors of Southern Oregon, Ashland, Oregon; May 26 - Washington and Oregon Convention of Bank Auditors and Comptrollers, Portland, Oregon.

Wilson has accepted appointment as chairman of the Division of Land Use and Classification for the Oregon State Planning Council.

Section of Forest Products

General - Rapraeger spent the month on detail in Washington working with Kirkland and Brandstrom.

C. C. Smoot of the Bureau of Chemistry and Soils has made his headquarters at the Station during the greater part of the month. Mr. Smoot has been conducting experiments on western hemlock bark designed to show

that this material can be artificially dried at a reasonable cost and without a decrease in the tannin content. Bark has been obtained from Cathlamet, Washington and Clackamas County, Oregon. Drying was carried on in a Proctor and Schwarz dryer at the Plylock Corporation in St. Johns.

Lumber, Log and Shingle Census - The biennial census of manufacturers for Oregon and Washington covering lumber, logs, shingle and lath production in 1933 was completed during the month. Preliminary compilation indicates that the 1933 lumber cut of these two states amounted to about 5,500,000,000 feet, an increase of about 40 per cent over that of 1932. Douglas fir constituted about 72 per cent of the production and ponderosa pine 17 per cent.

During 1933 there were 840 active sawmills as against 643 in 1932.

Shingle production amounted to about 2-3/4 billion pieces in 1933 as against 2 billion in 1932 and 2-1/2 billion in 1931.

Forest Survey - Requirements Phase - Data on the amount of fencing on Oregon and Washington farms transcribed last winter from the files of the Federal Land Bank at Spokane have been summarized. The preliminary draft of a report on timber requirements for farm fencing in the region has been prepared and submitted to the farm management departments at Corvallis and Pullman and to the Federal Land Bank at Spokane. Advantage will be taken of criticism and comment from these sources in drafting the final report.

Data showing farm acreage and amount of fencing was obtained from loan applications for 763 Oregon and 1510 Washington farms. There is such a marked agreement in the rods of fencing per acre on farms of similar acreage in the two states that the data can be combined to permit computation of ratios for the region. The fencing-acreage ratio decreases with an increase in farm size. For example, an average 10-acre farm in the region may be expected to have nearly 14 rods of fence per acre, a 40-acre farm 8.5 rods, a 600-acre farm 2.5 rods, and a 3000-acre farm 1.5 rods. On the basis of these ratios and the 1930 census data, there are approximately 81-1/2 million rods of fencing in Oregon and Washington. With the use of one post per rod of fence and a 12-year life for posts, an annual replacement requirement of nearly 7 million posts is indicated.

Forest Survey - Cutting Depletion - Tables and preliminary draft of office report covering log depletion in western Washington and Oregon in 1931 were prepared. These showed the total log depletion for this region to be 4,812,371 M feet, log scale, in 1931 or about 48 per cent of that occurring annually during the period 1925-1929. Douglas fir accounted for 74 per cent, and western hemlock, 16 per cent of this depletion.

Prices - During the month the annual log and shingle price compilations for western Washington and Oregon were completed.

Douglas Fir Mill Production Studies - The report on the study made in two Douglas fir mills of 100 M capacity in 1932 has been completed. It has been reviewed by the Office of Management and by the Station staff, and

has been submitted to the cooperating companies for their comment and criticism. The finished report will be ready in June. It has been prepared as an office report, but three or four of the sections will be rewritten for publication in trade journals.

Minor Products - Charts showing weekly price quotations between January 1, 1920 and December 31, 1933 for cascara bark, cedar leaf oil and Oregon fir balsam have been prepared and distributed during the month. Price information on these items, as given in the Oil, Paint, and Drug Reporter will be kept current.

Because of the demand for copies of "A Chart for Computing the Volume of Poles, Piling and Round Timbers" prepared by Gould in 1918, this chart has been redrawn and photostated for distribution.

Deterioration of Fire-killed Timber - Lodewick and Johnson spent a day examining burns near Beacon Rock and Wind River. The latter was a 1902 burn on which a few snags had been felled. The Hamilton Hill area near Beacon Rock was burned in 1929 and is now being logged. Breakage appears to be higher than normal, the sap is generally sound but stained, and there is practically no insect damage.

Lodewick spent one day observing the sawing of fire-killed logs from the Tillamook area at the Stimson mill at Forest Grove. Most of these had been through the 1932 fire and showed but little deterioration. A few were from snags resulting from the 1918 fire, and as a rule were badly stained, showed no sapwood, and had many galleries made by the Ergates borer.

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SOUTHERN FOREST EXPERIMENT STATION

General

W. N. Sparhawk, of Washington, spent the last half of May visiting the Station and its work in Jasper County, Ga.; Lake City, Fla.; New Orleans, La.; Bogalusa, La.; W. W. Ashe Experimental Forest, Alexandria, La.; Urania, La.; and Crossett, Ark.

Forest Technician (NIRA) T. C. Evans has received a special Pack fellowship for a study of the utilization of round and worked-out timber in the naval-stores region. This project is to be carried out under the direction of and in cooperation with the Station, in connection with the Financial Aspects project.

R. B. Craig has been assigned to work on the Financial Aspects study in connection with the subsistence homestead project in Jasper and Putnam Counties, Ga.

R. E. Worthington joined the Financial Aspects staff May 1, coming directly from Yale University, where he has been working for his Doctorate in forest economics.

The preliminary work looking to a coordinated plan for the development and use of the new experimental forests selected by the Station has been delegated by Demmon to a committee of five staff members. The Station now has areas for experimental work on the Osceola, Homochitto, Biloxi, and Kisatchie National Forests or purchase units and at McNeill, Miss., and Crossett, Ark. There is a possibility of at least two more forests being selected soon (Holly Springs, Miss., and east Texas). With so many and so diverse areas and with a limited personnel, their most intelligent use demands careful planning.

The preliminary report on the W. W. Ashe Experimental Forest on the Kisatchie National Forest near Alexandria, La., has been prepared and copies sent the Supervisor, Regional Forester, and Washington office for comment and criticism. This Forest of 4,100 acres is representative of the longleaf pine area west of the Mississippi River beyond the natural range of slash pine. It includes some fine stands of young longleaf pine up to 40 years old, unregenerated areas with scattered trees averaging 10 to 15 seed trees per acre 10 inches or larger in diameter, dense stands of worthless oak with longleaf seed trees, open areas that will require artificial regeneration, and loblolly pine with mixed hardwoods along the small streams. These conditions include all the more important problems that will be encountered in administering forest land in the longleaf pine areas west of the Mississippi River.

Management

At Camp Pinchot, Fla., a test was begun of the use of poisons to kill back hardwood sprouts following cutting on 40 acres that were cut over by CCC last August.

A cooperative study with Dr. L. M. Turner of the University of Arkansas was initiated to correlate the growth of shortleaf pine in southern Arkansas to the site complex.

Reexamination of deadening work done during the 1933 growing season at Urania, La., showed that deep-notching in oak resulted in more than 90 per cent mortality during the first year, double-hacking produced about 20 per cent mortality in oak, and single-hacking less than 1 per cent mortality. These mortality figures are incomplete, but present indications seem to promise very nearly complete ultimate mortality in oak by all three methods. The results in other species with a wide sapwood show very little mortality or weakening by any of the three methods, although deep-notching and peeling look most promising at the present time.

Financial Aspects

In the subsistence homestead project in Georgia, 4,000 acres have been mapped as to forest type, density of stocking, and merchantability.

Aerial photographs have very materially speeded up this work. From these maps, farms will be laid out and a community forest, including the rougher forested areas, will be so designated. Craig will assist the farm-management specialists in laying out the forest areas and in making plans for forest management.

Erosion

Olsen attended a conference to discuss the policy of future CCC erosion-control work, at which it was decided to build fewer, less expensive dams selected by the judgment of trained, experienced men. The former policy was "When in doubt, build a dam." It is now "When in doubt, plant trees."

Forestation

Wakeley and Huberman continued routine measurements and general observations in the Catahoula nursery. Huberman completed the computations for the first phase of the nursery studies, dealing with reductions in final tree per cent traceable to the period between sowing and the removal of the cover, and is now preparing the report on this phase. The results emphasize the importance of controlled watering during the germination period, show that there is much more leeway in the time of removing mulch than had been supposed, and indicates, for the Catahoula nursery at least, unexpectedly good results from the use of a cover of nursery soil, without mulch.

A contour map has been prepared of all but 80 acres of the experimental planting tract on the Kisatchie National Forest, using a 5-foot interval, and all but 400 acres have been divided into precise 10-acre squares, according to the system used on the Olustee. The CCC is completing the exterior fence around this tract with material left after CWA disbanded; the interior fencing, and labor to erect it, have been bid for the fourth camp period, together with labor for planting crews. During May, Wakeley completed the tentative allotment of parts of the tract to various lines of work, setting aside the rougher northern portion for intensive short-time studies and for species mixtures, and reserving the large blocks of uniform soil and slope, in the southern portion, for Latin-square tests of spacing and of geographical sources of seed.

Forest Survey

On May 10, Captain Eldredge presented the work of the Survey before the annual meeting of the Georgia Forestry Association held at Augusta, Ga. Following this meeting, he took a 400-mile automobile trip through the Coastal Plain counties in southeast North Carolina. This area was found to contain only a small amount of longleaf pine timber and practically no active naval-stores operations. The present forest type is largely second-growth loblolly pine, although the original growth was mostly longleaf. For this reason, the immediate survey of the active naval-stores belt may not be extended into this portion of North Carolina on the same scale as in the regions to the South.

C. H. Coulter spent most of the month in the New Orleans office, assisting in the analysis of detailed information which he obtained in the field from approximately 500 turpentine-stilling operations located in 35 counties of southeastern Georgia, aggregating an area of approximately 11-1/2 million acres. This area produces more than 50 per cent of the naval stores made in the United States. With one assistant, Coulter had personally visited each of these operators. This special study, supplemental to the regular line-plot Survey data, was made to get certain facts needed to adequately interpret data on the production of naval stores in the Southeast.

One of the primary objects of the Southern Forest Survey in the active naval-stores region is to secure statistics that will show whether or not the naval-stores industry has at hand a sufficient supply of unworked timber to meet its future needs. A detailed study of the operation of each of the naval-stores producers was made, including information concerning (1) the number of crops of timber being worked; (2) acreage of working timber owned and leased; (3) the acreage of resting timber owned; (4) the quantity of spirits and rosin produced, etc.

Analysis of the questionnaire data showed that although there were only 505 turpentine-still operators in the unit under consideration, there were more than 6,500 persons who produced gum. Some of these sold the crude gum to stillers, others had their gum custom-stilled and sold the spirits and rosin in their own names. In general, those gum producers who also operated stills were either more efficient operators or were working more productive timber. The quantity of spirits produced per number of faces operated was twice as great for the stiller-producer as for the non-stilling producer.

Analysis of questionnaire information on 505 stillers showed that 51 per cent of the number of trees worked were on land owned by the operator, and 49 per cent were leased by the operator. Of the naval-stores area owned by operators, approximately 54 per cent is being worked, 23 per cent is resting, and 23 per cent does not bear longleaf or slash pine, and consequently can be considered as non-turpentine area.

Although the naval-stores working period for any turpentine face is frequently referred to as 6 years, many operators work out their turpentine faces in a shorter period of time. This is particularly true in times when the demand for naval-stores products is not great. The total number of present working faces is classified in the table below according to whether the individual face is now being worked for the first, second, third, etc., year.

Year of operation	Percentage of total number of faces
1st	22.0
2d	27.0
3d	13.0
4th	11.0
5th	14.0
6th	12.0
	100.0

The distribution of still operators on the basis of the number of trees being worked by each operator is shown in the following table:

Number of crops (10,000 faces) now being worked	Percentage of total number of still operators
0 to 3.9	24.6
4 to 9.9	46.4
10 to 19.9	20.2
20 to 29.9	4.2
30 and over	4.6

Adequate interpretation of much of the information obtained on this special naval-stores economics study must wait until the line-plot survey data for this 11-1/2-million-acre unit have been analyzed. Upon the completion of this analysis, more specific and detailed information on the present condition of the naval-stores industry will be available.

Pathology

During May, specifications were prepared for a proposed greenhouse to be erected on land owned by the City of New Orleans, Parkway Commission, and to be maintained by the Bureau of Plant Industry.

In the early part of May, experimental control of nursery diseases of black locust seedlings was initiated at the Louisiana State Forest Nursery near Woodworth. Among various chemicals tested, Tetrachlorethane has given the best results so far.

Experimental spraying of plots of longleaf pine seedlings, for brown-spot disease, was continued near Bogalusa, La.

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SOUTHWESTERN FOREST AND RANGE EXPERIMENT STATION

Forest Management

Two temporary men have been added to the Forest Research force during the past month. W. H. Walling, appointed under Nira, has had several years experience in the Forest Service, Indian Service, and Park Service, and during the past year was in general charge of stand improvement operations on the Santa Fe. G. H. Murphy, a University of Arizona graduate who has specialized in horticulture, soil chemistry and other subjects closely allied to forestry, is employed under ECW Research. Walling is establishing sample plots on stand improvement areas in the Fort Valley Experimental Forest. Murphy is studying causes of winter-killing and frost injury of conifers and is also taking a hand in nursery and planting work.

Krauch makes the following observations on Douglas fir reproduction at Cloudcroft:

"Seedlings in the experimental plots are putting on new growth so evidently they are now out of danger. Although there were some losses due to winter-killing the majority of seedlings survived. Therefore, in view of the severe test of the past winter I cannot see that winter-killing of seedlings is a prime factor in the dearth of Douglas fir reproduction. I still believe that rodents are primarily responsible and secondly, failure of seed to become adequately buried in the soil. The results of the seed spotting work to be done this summer should tell whether this is so or not."

Growth Studies

Two sample plots on cutover land on the Gila Forest were established in 1912, and remeasured at 5-year intervals since that year. One plot, designated S1A, on a steep slope, south exposure, at an elevation of 9300 feet, is in mixed Douglas fir-ponderosa pine. Plot S2A, on a moderate slope at an elevation of 7300 feet, is in a pine stand composed of ponderosa and Arizona pine. The stand of timber on these two plots by broad diameter classes in 1912, 1922 and 1932, is shown in the following table:

Diameter Classes (inches)	Number of trees per acre					
	Plot S1A			Plot S2A		
	1912	1922	1932	1912	1922	1932
	No.	No.	No.	No.	No.	No.
4" - 11"	24.4	83.3	163.2	18.4	25.2	110.7
12" - 20"	15.2	18.5	21.2	13.6	16.1	17.0
21" and over	1.5	2.3	4.5	1.4	1.7	2.5

The large increase in number of trees indicates not only good stocking but also the building up of a desirable gradation of diameter classes. Similar development of cutover stands is becoming manifest on many of the sample plots in Region 3. On some of the Coconino and Tusayan plots, 30 to 40 years will be required to fill in the diameter classes below 12 inches; but with few exceptions the seedlings and saplings now on the ground point unmistakably to the same evolution that has taken place on the Gila plots.

The volume of trees above 3.5 inches on plot S1A has increased during the past 20 years from 980 cu. ft. to 1,666 cu. ft. per acre, or at a rate of 34 cu. ft. per year. The board foot volume over the same period increased from 4,070 feet per acre in 1912, to 5,890 feet per acre in 1932, or a net increase of 91 board feet annually.

Plot S2A with a reserve volume of 616 cu. ft. per acre in 1912, increased to 927 cu. ft. or at the rate of 15-1/2 cu. ft. per year. In board feet the increase was from 2,338 in 1912 to 3,374 in 1932, or a net annual increment of 52 board feet per acre.

Parker Creek Branch Station

Two construction projects at the Parker Creek Experiment Station were completed this spring by the CCC boys of the A-Cross Camp. One consisted of the building of four concrete lysimeter tanks, 8 feet deep, 8 feet wide and 12-1/2 feet deep on the steep mountain slope northwest of the station. The soil taken from the excavations was replaced in the tanks and the cover of vegetation (shrubs and grasses) restored. The rainfall run-off from the ground surfaces, which have a 30 per cent slope, is collected in baffles equipped concrete ditches where the silt is held up. Surface run-off and percolation water which reaches the bottom of the lysimeter drain into separate storage tanks.

The second project included the building of a truck trail down the west side of Parker Creek to three natural drainage areas. Each of the three areas was fenced and equipped with improved venturi water flumes for measurement of run-off, and a silt basin in which eroded material will be impounded. A characteristic feature of the three drainages is the rock bottomed water courses which make possible the measurement of surface run-off plus the underground water which reaches the drainage channel.

Jornada Experimental Range

Range and Climate

The cooperator sold 151 steer yearlings April 27 for shipment to the Denver stockyards. They weighed an average of 361 lbs. and brought 4-1/2 cents. This is below the average Jornada weight for yearlings but this bunch represents the balance after pretty close "topping" during the winter.

On May 22-23 came the end of the driest 7-month period since 1924. There had been only 1.02 inches of rainfall since last October until the recent rain which totaled 0.85 inch at headquarters and ranged from 0.20 inch at Middle Well to 1.14 inches at Period Study enclosure. An additional 0.31 inch fell during the night of May 28. Three of the large surface tanks caught water. This will relieve the situation greatly by making more range available and lessening the congestion around headquarters especially. Cattle held up fairly well considering the extreme conditions, and the cooperator had only begun feeding when the rains came.

Activities

The CCC Camp pulled out for Wyoming May 7. Andy Krofchek took over the contingent for the transfer, relieving Superintendent Stambaugh who left for Prescott to take charge of the Blight Control Work on the Prescott Forest. Ward and Kendricks, two former members of the facilitating personnel, remained in charge of the vacated camp as custodians.

The annual picnic and outing of the Junior and Senior classes of the New Mexico State College was held at the new recreation area at Ropes, April

20. About 100 student and faculty members attended. Judging from the complimentary remarks by the picknickers and later press reports, this project has taken hold of the public in a big way.

Several other groups used the Ropes Springs area during May and all pronounce it a highly satisfactory improvement.

Bomberger, in charge of Range Surveys, reports the following progress during the month:

Recompilation of the 1915-16 Mesa range reconnaissance data, to a basis comparable with the last reconnaissance of the area, made in 1928, required practically the entire month of May. Tentative analyses of the data thus far, have indicated a much higher estimated density in 1915-16 than either the 1923 or 1928 range surveys of the mesa portion. In order to determine what adjustments should be made in the estimates of 1915-16 densities, a detailed comparative study and analysis of the revegetational study quadrat data for that period in its relation to the data for the same quadrats obtained in 1928, is under way. A check on the possible variation between the chartograph and hand methods of quadrat charting is also being made, by applying both methods to a series of the same quadrats already compared, and the variation to be determined on the basis of the total square centimeter areas obtained by the two methods, in connection with the density analysis.

Cassidy, in charge of the revegetation project, reports:

Most of April was spent in the field in Major enclosure No. 2. During the first part of the month an intensive vegetative survey was made of the enclosure by running lines at 10 chain intervals. A 5 chain strip surrounding the area was included.

The mesquite sand dunes in plots 8, 10, 15, and 16 were trenched to a depth of 26 inches, cutting all roots to that depth. This was done in an attempt to study the water relationships between the wide-spreading mesquite roots and the roots of the plants between the dunes.

The spring plantings of black grama sod at 2, 4, and 8 feet intervals were made in plots 12, 13, and 14.

With the use of a spiked-tooth harrow, the soil was broken and seed was sown in plots as follows: plots 15 and 17, Aristida divaricata, 18-Sporobolus flexuosus, 19-Muhlenbergia porteri, 20 Bouteloua curtipendula and Andropogon saccharata, 22-Atriplex canescens, 23-Franseria acanthicarpa, 24-Gutierrezia sorathrae, 25-Artemizia filifolia, and 26-a mixture of grass and weed seeds.

At odd times during the month, the old rain gauge stands were replaced with the new iron stands made at Camp F-27-N.

A good portion of May was spent on quadrat compilation. The "AR" and "H" series were checked for the years 1929, 1930, 1931, and 1932; and compiled for 1933. The compilation on the D series for 1928 and 1930 and the E series for 1927 was checked.

The regular May planting of Bouteloua eriopoda at 4 feet intervals was made May 21. A series of soil samples to be taken at 3-day intervals in Major enclosure No. 2 was started, the first samples being taken May 23.

Little, in charge of Poison plant eradication, reports:

Additional transplantings of Scleropogon bravifolius were made in 9 chain square plots at 2, 4, and 8 ft. intervals and at 5 ft. intervals in moisture conservation pits. Seed of this grass was sown in 3 plots and seed of Panicum obtusum in 2 plots. Furrows were plowed on 6 plots for establishment of sand and dams were plowed for conserving water.

Seed of grasses, poisonous plants, and other species collected in 1932 and 1933 was cleaned in preparation for germination tests.

One Drymaria plot was plowed and another was harrowed as possible means of eradication of Drymaria. One plot each of Senecio longilobus, Actinea odorata, and Asclepias galioides was grubbed. The experiments and methods of eradication of poisonous plants on the Santa Rita Experimental Range were observed.

Germination tests were made of the seeds of 1932 and 1933 collections of grasses and other plants from the Jornada range. Similar tests of Drymaria and other poisonous plants were conducted. Weekly soil samples of adobe were taken at four stations within the Drymaria enclosure and soil moisture percentages were determined. Field observations were made of these poisonous plants: Astragalus allochrous, Astragalus bigelovii, Astragalus crassicarpus, Asclepias galioides, Actinea odorata, and Senecio longilobus. Specimens were collected of the poisonous species and the insects on them. On an acre of Flourensia, the woody plants were cut down to the ground to study effect on revegetation of grass.

Santa Rita Experimental Range

Station Personnel

The entire Santa Rita staff has now moved to Florida Station for the summer field season, and in addition to the regular force now numbers among its personnel the following: Junior Range Examiners Volney D. Douglas, Robert R. Humphrey, and George E. Glendenning, Range Technician D. M. Gorsuch, Clerk Elizabeth Brown, Assistant Clerk Judith Carlock, Field Assistant Earl Rhineheart.

Professor McGinnies has a force of three men at the Station and will have two additional men around the first of July.

Range and Climatic Conditions

Range conditions contunue very much below average with no spring growth of perennial grasses or annuals of any kind. Browse species have leafed out well and are furnishing a much larger proportion than usual of the feed available for stock on the Range. Adjustments of stock to reserve pastures has

continued throughout the spring but in the aggregate has only meant moving a comparatively small number of breeding cows. No feeding has been necessary as all classes of stock are in about average condition for this season of the year and should carry through until the summer rains begin without trouble.

Poverty losses on other ranges throughout Southern Arizona have already been heavy and may reach serious proportions before the new crop of forage starts. In most cases both feed and water are extremely short. Several inquiries have come from outsiders concerning the possibility of renting pasture on the Santa Rita experimental range.

Rainfall during the spring has been about 50 per cent below average, with very poor distribution that has rendered most of it ineffective in so far as promoting any spring growth was concerned. For the first time in many years (12 years for which the records are known) the Santa Rita Mountains were practically free from snow throughout the winter. This condition may have a serious effect on our range wells which depend entirely on rain and snow falling on the mountains.

Rodent Control

Control work on the smaller rodents -- under the direction of Mercer -- has progressed favorably and should be largely completed by the end of June. After July 1, the work will be concentrated on the control of jack rabbits and cottontails, of which about 5000 have been killed to date. As a means of observing results of control work a number of permanent plots have been laid out and notes taken on the vegetative cover with the purpose in mind of finding out -- during the next few years -- just what influence the rodent population may have had on growth of the important forage species.

Poisonous Plant Investigations

Studies of burro weed -- involving something about its life history and distribution on the range as well as its control -- have progressed according to schedule. Control measures so far tried have included burning, spraying with acid, grubbing, and protection from grazing. These methods have been applied on permanent study areas under spring range conditions and will be applied to adjoining areas under fall conditions. At the present time Humphrey is preparing a brief report on the spread of burro weed as influenced by varying periods of protection against cattle grazing.

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RESEARCH IN REGION 2

On May 2 Roeser was called to Denver to confer with the Regional Forester concerning the forest practice rules of the lumber code for the Rocky Mountain District of the Western Pine Division, and to attend the Lumber Code conference of timber operators. This conference was held on May 5, and the rules were adopted as presented, with only a few minor changes.

Type Study (T-1):

The complete complement of meterological observations covering the period of the growing season was begun on the first of the month. The growing season this year opened unusually early. The usual late spring storms were lacking; since the first of April there has been an appreciable deficiency in precipitation. As a result the Region is once more in the throes of a mild drouth, which, however, has not yet become very serious.

The continuous accumulation of an excess of mean temperature for the past eight months or more is reflected in the performance of the vegetation this spring. It is difficult to recall any season within the last decade or two when the herbaceous vegetation and the trees sprouted earlier in the year. The local (Fremont) record of the earliest date of flowering for the more important local flowering herbs shows that, of the 28 species that produced their first flowers on or prior to June 4, the date of original emergence for all of these species antedated that for any other year since the first record was made about 1925. Compared with the average date of the first flowering in previous years for the species in question the season was 22 days earlier than normal. One or two species were as much as 34 days ahead of their normal flowering time.

Seed Production in Douglas Fir (Fs-161-c):

Flower counts on 24 selected trees growing at elevations ranging between 6800 and 9400 feet above sea level were begun as early as April 30, when flowers were found to be out or in a state of emergence on trees throughout the entire altitudinal range of the species. This year's crop of flowers easily constituted the most abundant to be observed within the 12-year period during which this study has been carried on.

As was to be expected in view of the very early date of flowering, this year's crop was exposed to the frost hazard with very destructive results. On May 13 and 14, a relatively light spring storm brought 6.1 inch of snow accompanied by a drop in temperature to 21° at the Fremont Station. (The record for the Colorado Springs weather station whose elevation is about 900 feet below that of the lowest tree in the experimental series, is not available,) The effect upon the flower crop of Douglas fir is best shown in the following tabulation:

Range of Elevation (Feet above sea level)	No. of Trees	Number of flowers produced per tree			Percentage of loss (per cent)
		Maximum	Minimum	Average	
6900-7500	5	2600[6]	49	1258	6
7500-8500	7	1792	37	768	83
8500-9000	7	1304	1	534	99
9000-9400	5	392	65	226	100

As nearly as can be determined, the more or less wholesale destruction of blossoms above the 7500 foot level is attributable to freezing. Many of the blossoms, in fact most of them, are believed to have been fertilized, since

practically all of the staminate flowers had ripened and shed their pollen several days prior to the storm. While in most cases, immediate mortification set in, some of the blossoms on the trees within the lower limit of the zone in which destruction by freezing was heavy appeared to die off gradually, which might indicate a failure to set. All in all, however, the facts seem to indicate that the decimation of the abundant flower crop and the loss of a potentially large cone crop is the result of freezing, and that this element constitutes the primary factor of hazard with which this early flowering species has to contend.

Seed Production in Engelmann Spruce (Fs-146-c):

The first flowers of the species were observed on May 17, a date approximately two weeks in advance of the normal date of flower emergence in the locality of the Fremont Station. Of the 38 trees within the experimental plot, 32 produced flowers, the crop being an unusually heavy one. A total of 5634 flowers were counted on the one-tenth acre experimental area. Since the biological habit of this species relative to flower emergence seems to be more closely coordinated with the climate of the habitat, a very heavy cone crop appears to be in prospect next fall.

Management of the Experimental Forest (M-1):

The tagging and initial measurement of the residual stand on three of four one-acre plots that were laid out last winter and logged by a Nira crew were accomplished early in the month. Also, during the course of the month, 11 plots - aggregating 9 acres - with whose establishment in 1929 the first management unit within the forest was placed completely under regulation, received their first periodic remeasurement. Among these is the plot that contains as nearly a pure limber pine stand as may be found within the natural habitat of this species in the Pikes Peak Region. Although time has not been found to compile the record for this plot, it is evident that growth for the elapsed period has been very slow. Incidentally, it may be observed that this species (limber pine) appears to have suffered more severely than any other local species from the effects of the past several years' drouth.

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WASHINGTON OFFICE

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MANUSCRIPTS

PACIFIC NORTHWEST

J. E. Lodewick, and E. S. Harrar	"Identification and Microscopy of Woods and Fibers Used in the Manufacture of Pulp: Part III, Fibers." Submitted to The Paper Industry.
J. E. Lodewick	Chart of Cascara Bark Prices, f.o.b. New York, 1920-1933.
J. E. Lodewick	Chart of Cedar Leaf Oil Prices, f.o.b. New York, 1920-1933.
J. E. Lodewick	Chart of Oregon Fir Balsam Prices, f.o.b. New York, 1920-1933
J. E. Lodewick	Technical Review of "Preventing Stain & Decay Losses in Jointed Wood Products". Submitted to The Timberman.
J. E. Lodewick	Chart for Computing Volume of Poles, Piling & Round Timbers, redraft of chart of same title issued in 1918.
H. M. Johnson	Log Prices by Regions, West Side Oregon, Washington, and British Columbia, 1919 to 1933 inclusive.
H. M. Johnson	Average Western Wholesale Prices per Square of Western Red Cedar Shingles f.o.b. Mill, Oregon, Washington, and British Columbia, 1933.
E. L. Kolbe	Determining Stocking in the Ponderosa Pine Type by the Stocked Quadrat Method (for Journal of Forestry)
W. G. Morris	Lightning Storms and Fires on the National Forests of Oregon and Washington (To be mimeographed)
T. T. Munger and W. G. Morris	A Nineteen-year Record of Douglas Fir Progeny from Various Localities and Types of Parent Trees (For Journal of Agricultural Research)
H. B. Shepard	Forest Fire Insurance in the Pacific Coast States.
L. A. Isaac	The Forest Soil of the Douglas Fir Region and Changes Wrought upon It by Slash Burning. (For Journal of Agricultural Research)
Isaac, Leo	Seedling Establishment in Relation to Environmental Factors of Logged-off Land in the Douglas Fir Region. (For J.A.R.)

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E. S. Harrar and J. E. Lodewick	Identification and Microscopy of Woods and Fibers Used in the Manufacture of Pulp: Part II, The Hardwoods. (The Paper Industry, May, 1934)
Meyer, Walter H.	Growth in Selectively Cut Ponderosa Pine Forests of the Pacific Northwest (Tech. Bul. 407)
Pierce, L. T.	Temperature Variations along a Forested Slope in the Bent Creek Experimental Forest, N. C. (Monthly Weather Review, January, 1934.)

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